ACUTE TOXICITY SUMMARY

# TRIETHYLAMINE

*(diethylaminoethane; ethanamine; N,N-diethylethanamine)*

**CAS Registry Number: 121-44-8**

## I. Acute Toxicity Summary (for a 1-hour exposure)

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| *Inhalation reference exposure level* | **2,800 µg/m³** |
| *Critical effect(s)* | visual disturbances and ocular irritation in healthy human volunteers |
| *Hazard Index target(s)* | Nervous System; Eyes |

## II. Physical and Chemical Properties (Nelson and Bull, 1990)

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| *Description* | colorless liquid |
| *Molecular formula* | $C_6H_{15}N$ |
| *Molecular weight* | 101.9 |
| *Density* | 0.726 g/cm$^3$ @ 25°C |
| *Boiling point* | 89.3°C |
| *Melting point* | -115°C |
| *Vapor pressure* | 400 mm Hg @ 31.5°C |
| *Flashpoint* | -6.7°C |
| *Explosive limits* | unknown |
| *Solubility* | soluble in water above 18.7°C; very soluble in acetone, benzene and chloroform |
| *Odor threshold* | 0.36 - 1.12 mg/m³ |
| *Odor description* | fishy odor |
| *Metabolites* | acetaldehyde, ammonia and urea |
| *Conversion factor* | 1 ppm = 4.14 mg/m³ @ 25°C |

## III. Major Uses or Sources

Triethylamine (TEA) is primarily used as a cross-linking catalyst in the production of polyurethane foam used in the manufacture of cores for metal castings (Albrecht and Stephenson, 1988). Triethylamine is also used as a catalyst for epoxy resins, and as a corrosion inhibitor for polymers (Nelson and Bull, 1990).

## IV. Acute Toxicity to Humans

Vapors of TEA may cause irritation of the mucous membranes resulting in lacrimation, conjunctivitis, corneal edema, cough and respiratory distress (Albrecht and Stephenson, 1988).

Headache, nausea, and faintness may also be observed following TEA exposure (Albrecht and Stephenson, 1988).

Two volunteers exposed to 4.35 ppm (18 mg/m³) TEA for 8 hours, experienced visual disturbances (hazy vision and halo perception); corneal edema was observed in these individuals (Akesson *et al*., 1985). The ocular effects were transient, and resolved within hours of the exposure. Similar symptoms were reported by workers exposed over an 11-week period to 2.90 ppm (12-13 mg/m³) TEA (Akesson *et al*., 1986). However, eye examinations performed in these workers were normal, without signs of corneal edema.

*Predisposing Conditions for Triethylamine Toxicity*

**Medical**: Unknown

**Chemical**: Unknown

## V. Acute Toxicity to Laboratory Animals

Lethality studies in several animal species are relatively consistent: (1) exposure to 1,000 ppm for 4 hours was lethal to 1 of 3 guinea pigs (Carpenter *et al*., 1948), (2) exposure to 1,425 ppm for 2 hours was lethal to an unspecified percentage of mice (Izmerov *et al*., 1982); and (3) exposure to 1,000 ppm for 4 hours was lethal to 1 of 6 rats (Smyth *et al*., 1951). The acute oral $LD_{50}$ is 460 and 546 mg TEA/kg in rats and mice, respectively (RTECS, 1993).

No significant gross or histological changes were observed in male and female rats exposed for 6 hours/day, 5 days/week for 28 weeks to TEA concentrations up to 247 ppm (1,023 mg/m³) (Lynch *et al*., 1990). However, degeneration of heart muscle, hepatocellular necrosis, and pulmonary edema were observed in rabbits following exposure to 100 ppm (414 mg/m³) TEA for 7 hours/day, 5 days/week, for 6 weeks (Brieger and Hodes, 1951). Exposure of rabbits to 50 ppm (207 mg/m³) TEA for 5 days/week for 6 weeks caused corneal edema and erosions. Pulmonary irritation in these rabbits was evidenced by peribronchial lymphocyte infiltration and slight hepatic parenchymal degeneration.

## VI. Reproductive or Developmental Toxicity

Triethylamine is highly teratogenic to chick embryos. The $ED_{50}$ for embryotoxicity and unspecified external malformations is 0.9 µmol/egg (Korhonen *et al*., 1983).

## VII. Derivation of Acute Reference Exposure Level and Other Severity Levels (for a 1-hour exposure)

**Reference Exposure Level (protective against mild adverse effects): 2,800 µg/m³**

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| *Study* | Akesson *et al*., 1985; Akesson *et al*., 1988 |
| *Study population* | two healthy human volunteers |

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| *Exposure method* | 8 hour exposures to 10 or 20 mg/m³ TEA |
| *Critical effects* | visual disturbances, eye irritation, and transient corneal edema |
| *LOAEL* | 20 mg/m³ |
| *NOAEL* | 10 mg/m³ |
| *Exposure duration* | 8 hours |
| *Equivalent 1 hour concentration* | 28 mg/m³ ($C^2$ * 1 hr = [10 mg/m³]$^2$ * 8 hrs) |
| *LOAEL uncertainty factor* | 1 |
| *Interspecies uncertainty factor* | 1 |
| *Intraspecies uncertainty factor* | 10 |
| *Cumulative uncertainty factor* | 10 |
| *Reference Exposure Level* | 2.8 mg/m³ (2,800 µg/m³; 0.68 ppm; 680 ppb) |

**Level Protective Against Severe Adverse Effects**

No recommendation is made due to the limitations of the database.

**Level Protective Against Life-threatening Effects**

No recommendation is made due to the limitations of the database.

NIOSH (1995) has developed a 30-minute IDLH value of 200 ppm (830 mg/m³). The value is based on three animal lethality studies: (1) a 4 hour $LC_{33}$ of 1,000 ppm for guinea pigs (Carpenter *et al*., 1948), (2) a 2 hour $LC_{lo}$ of 1,425 ppm for mice (Izmerov *et al*., 1982); and (3) a 4 hour $LC_{33}$ of 1,000 ppm for rats (Smyth *et al*., 1951). Using duration extrapolation to 30 minutes and a ten-fold uncertainty factor, the three data sets yielded values of 200 to 228 ppm.

## VII. References

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